Antimicrobial Resistance in Plant Production

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Introduction

• Agriculture intensification has led to significant increase in use of agrochemicals

• Bacteria and fungi cause significant losses in crop production

• Pesticides reduce losses caused by microbes in crops

• Climate change and variability predicted to increase plant disease incidences thereby increase use of antimicrobials in crops
Introduction

• Overuse and misuse of pesticides have negative impacts which are:
  • Risk to consumers (residues affect food safety)
  • Pollute the environment
  • Development of resistance in the microorganisms (AMR)

• Types of antimicrobials
  • Antibiotics (Streptomycin, tetracycline, ...) approved for use in at least 20 countries and used in high value crops and seed production (not used in Zimbabwe)
  • Fungicides used to control bacteria and fungi
  • Protectants applied fortnightly starting from 2 weeks after crop emergence up to physiological maturity
  • Curatives applied after appearance of symptoms
Challenges

• Residues of fungicides and antibiotics may encourage emergence of resistant strains of fungi and bacteria

• In developing countries, the quantity and types of antimicrobials used for agronomic purposes not properly documented

• Challenges of access to quality-assured antimicrobials, including a growing industry of fraudulent and substandard products.

• The consequences of AMU in plant production resulting in occupational exposure, food, and environmental contamination need to be assessed in order to develop science-based recommendations for mitigating the negative public health impacts of AMR
Solutions

• Integrated Pest Management (IPM Strategy)

• Effective approach to limit the use of antimicrobials in plant production

• Key components of IPM:

  • Accurate diagnosis and monitoring, which can also include disease modelling and predictive systems to optimize timing of plant protection product applications

  • Use of disease resistant crop varieties, including resistant rootstocks in both fruit and vegetable systems
Components of IPM

• Exclusionary practices that prevent the introduction of pathogens into a crop, such as using pathogen-free true seed and vegetative planting material, clean irrigation water and sanitation practices that prevent the movement of pathogens from plant to plant and field to field

• Careful site selection and soil improvement to maximize plant health and minimize environmental factors that favour pathogens

• Crop rotation and other cultural practices to prevent pathogen build-up

• Use of antifungals and antibacterials with different modes of action not shared with drugs used in human medicine

• Use of effective biologicals (probiotics, prebiotics, bacteriophages) and biorational compounds for disease control

• Exploitation of the microbiome and soil health to control plant diseases; and

• Judicious use of antimicrobials, including both antibiotics and fungicides.
Way Forward

• Use tools and activities which will help to understand and mitigate risks associated with AMR from agronomic sources

• Use surveillance, good agricultural practices, awareness and strengthened government regulation for AMU to contribute to a more effective One Health approach to solve problems of AMR

• Creation of new, rapid and inexpensive tests and tools to diagnose plant diseases and characterize the resistome of plant production environment

• To characterize and develop AMU guidelines so as to standard the use of antimicrobials

• Development, validation and application of additional containment prevention strategies along the entire food chain to reduce AMR in foods of plant origin
Thank you!